



High School Math Emergency Sub Binder

Emergency sub plans for high school math, grades 9 to 12, any course. The sub needs no math background: every step is on the page.

PREVIEW

What is included

- 7 front pages: binder cover, important information, note to the sub, the lesson plan filled in, schedule, class list and dismissal, how it went
- 9 activities, each with its own sub script and student pages (29 pages)
- 3 individual activities and 6 partner, team or whole-class activities
- A Say this to the class script for every activity, a star challenge on every worksheet, every answer in a key
- Color and ink-saver B&W, US Letter and A4

How it works

1. Leave the binder out. The lesson plan lists every activity with its page and minutes.
2. The sub reads the Say this to the class box word for word.
3. Students work from their own pages, with the steps on the page. The sub needs no math background: every answer is in the key.
4. No prep and no tech: print and go.

The 9 activities, 35 to 45 minutes each

1. **Quiet Reading**, 45 min **SOLO**: reading for detail with math inside: similar triangles, the tangent ratio, linear vs exponential growth
2. **Math Error Detective**, 40 min **SOLO**: finding and fixing one wrong step in equations, exponents, quadratics, trig, probability and radicals
3. **Practice Menu**, 45 min **SOLO**: mixed review: equations, functions, quadratics, exponents, radicals and real-world problems
4. **Partner Check**, 40 min **PAIRS**: equations, slope, functions, systems, exponents, quadratics, radicals, special triangles and probability
5. **Price the Spring Concert**, 40 min **PAIRS**: linear and quadratic models: revenue, the vertex, symmetry, profit, a table and a graph
6. **Math Puzzle Tournament**, 41 min **TEAMS**: equations, factoring, polygons, distance, arcs, trig ratios, sequences, transformations and data
7. **The Robotics Showcase Mix-Up**, 40 min **TEAMS**: the mean, fractions and percent of a number, sums, products and multiples, reasoning from clues
8. **Which Is Greater? Stand-Off**, 40 min **WHOLE CLASS**: comparing function values, rational exponents, radicals, slopes, trig values, mean and median, probability
9. **Whiteboard Quiz Game**, 35 min **WHOLE CLASS**: a review of this binder's math: equations, functions, quadratics, exponents and radicals, geometry

What this preview shows: the note to the substitute, the lesson plan, the other front pages, one page of every activity, a sub script, four more student pages and one ink-saver page. Every product page is watermarked, and no answer key is shown. The full binder has 36 pages.



Note to the Substitute

High school math, grades 9 to 12, any course · 9 one-period activities · no prep, no math background needed

Thank you for covering my class

Everything you need is in this binder. The front pages (important information, lesson plan, schedule of the day, class list) are filled in for today. After them come 9 math activities: the first 3 are individual work, the other 6 are for partners, teams or the whole class. Each one fills most or all of a period of 40 to 55 minutes, runs from the printout alone, and carries its own problems and answer key, so you never have to teach new math or work anything out yourself. Everything reviews high school math, mostly Algebra 1 with some Geometry and Algebra 2; students may skip a topic the class has not met yet.

The first page of every activity is your script. It says what the activity practices, how to set it up, and how long each step takes. The box marked **Say this to the class** is written to be read aloud word for word. Every answer is in a key on the script page (for the logic mystery, on the page right after the script). Keep those pages with you and hand out only the student pages. Every student worksheet has a **Challenge** box for early finishers (in the logic mystery, the bonus question on the slip).

The 9 activities

- **Quiet Reading** quiet single · 45 min · p. 7
- **Math Error Detective** quiet single · 40 min · p. 12
- **Practice Menu** quiet single · 45 min · p. 15
- **Partner Check** pairs · 40 min · p. 19
- **Price the Spring Concert** pairs, project · 40 min · p. 22
- **Math Puzzle Tournament** teams, puzzles · 41 min · p. 25
- **The Robotics Showcase Mix-Up** team logic · 40 min · p. 28
- **Which Is Greater? Stand-Off** whole class · 40 min · p. 32
- **Whiteboard Quiz Game** whole class, teams · 35 min · p. 34

If the class is loud

- Switch to a quiet single activity: Quiet Reading, Math Error Detective and Practice Menu. Nobody needs to move.
- In the scored games (Math Puzzle Tournament, Which Is Greater? Stand-Off and Whiteboard Quiz Game), the scoring keeps the class honest.
- If an activity is not working, stop it and switch. Every activity can start at any point in the period.
- The games are optional: a fun way to end the class or to use extra time.

Which activity when?



- A student says the class never learned this? Every activity reviews earlier work. Ask them to try the first problem with a partner, and leave me a note.
- The same activity in every period is fine: each class sees it once. The lesson plan (next page) lists all 9. Calculators: follow my rule on the Important Information page.
- First thing in the day, or a class that needs to settle: start with a quiet single activity.
- After lunch or with a restless class: a group activity uses the energy.
- Short period? These fit: Whiteboard Quiz Game (35 min) and one reading of Quiet Reading (about 20 min).

Before you leave

Please fill in the How It Went page at the back. It takes two minutes and I read every word. Thank you!





Lesson Plan

Filled in for today: 9 activities, 35 to 45 minutes each. Write the time of each period you use.

ACTIVITY	PLAN	PAGE
Quiet Reading Quiet single · about 45 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> One reading and its question sheet per student; fast finishers take the other Silent reading and questions, about 20 minutes per reading Read the answers out from the key, or collect for me 	p. 7
Math Error Detective Quiet single · about 40 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Hand out both case sheets; pencils only Students find the one wrong step in each solution, explain it and fix the answer Read the key out at the end, or collect for me 	p. 12
Practice Menu Quiet single · about 45 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Three sheets on the desk: A Secret Message, B Match It, C Real-World Problems Students choose one, work alone in silence, swap it when done Check against the keys on the script, or collect for me 	p. 15
Partner Check Pairs · about 40 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Pairs: one Partner A sheet and one Partner B sheet Both solve row 1, then compare: the answers must match Different answers? Find the slip together. The key is on the script 	p. 19
Price the Spring Concert Pairs, project · about 40 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Pairs or threes, one Part 1 sheet and one Part 2 sheet each Part 1 together (keyed), then build a price table, plot it and choose a price Check Part 2 with the checklist on the script; collect for me 	p. 22
Math Puzzle Tournament Teams, puzzles · about 41 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Teams of 3 or 4, one puzzle sheet and one answer sheet per team One round at a time, 1, 2 or 3 points per puzzle Every answer is on the key. The key settles arguments 	p. 25
The Robotics Showcase Mix-Up Team logic · about 40 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Teams of 3 or 4, one case file and one grid per team Warm-up together on the board, then the case on their own Teams hand in their slip; check it against the key and reveal 	p. 28
Which Is Greater? Stand-Off Whole class · about 40 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> One sheet per student; everyone stays seated Read a pair, 20-second guess, count hands, then 90 seconds to work it out One speaker per side, then read the answer from the key 	p. 32
Whiteboard Quiz Game Whole class, teams · about 35 min Time ____ : ____ to ____ : ____	<ul style="list-style-type: none"> Draw the 5 by 5 board (or tape up the board sheet); 3 to 5 teams Teams take turns picking a category and value; you read the question Right answer: points on the scoreboard. Optional, for the end of class 	p. 34

Fast finishers

Any quiet single activity can follow any other activity: Quiet Reading (p. 7), Math Error Detective (p. 12) and Practice Menu (p. 15).

Collect / leave for me

.....

.....

How Tall Is That Tree?

Read the whole text before you look at the questions.

How Tall Is That Tree?

Foresters and curious students all meet the same problem: a tree is far too tall to measure with a tape. Instead, they measure it from the ground with two ideas from geometry class, similar triangles and the tangent ratio.

The first method needs a sunny day. Push a straight stick into level ground and measure the stick and its shadow. At the same moment, measure the tree's shadow. The sun's rays hit the stick and the tree at the same angle, so the stick and its shadow form a small right triangle and the tree and its shadow form a larger one with the same shape. In similar triangles, matching sides are in the same ratio. If a 3-foot stick casts a 2-foot shadow, every upright object nearby is 1.5 times as tall as its shadow is long, so a tree with a 40-foot shadow is about 60 feet tall.

On a cloudy day there are no shadows, so foresters use an angle instead. They stand a measured distance from the trunk and aim a clinometer at the top of the tree. A simple clinometer is a protractor with a string taped along its flat edge and a weighted string hanging from its center. The string shows the angle of elevation, the angle between level ground and the line of sight up to the treetop.

The height comes from the tangent ratio. In a right triangle, the tangent of an angle is the opposite side divided by the adjacent side. Here the adjacent side is the distance to the trunk, and the opposite side is the height of the tree above eye level. Standing 50 feet away with an angle of 40° , a forester multiplies the distance by $\tan 40^\circ$, which is about 0.84 . $50 \times 0.84 = 42$ feet. One last step is easy to forget. The angle was measured from the forester's eyes, not from the ground, so the eye height of 5 feet is added, and the tree is about 47 feet tall.

Careful measurers know their numbers are estimates. A reading that is off by two degrees can change the answer by several feet, so they take three readings and use their mean. Some skip the tangent entirely; they walk back until the angle is exactly 45° . The tangent of 45° is 1, so the height above eye level equals the distance to the trunk.

eye 5 ft distance to the trunk: 50 ft height above eye level: ?

The angle between the line of sight and the horizontal is 40° .

1. Quiet Reading, 45 min (solo)

Math Error Detective

Each solution has exactly one wrong step. Write its number, what went wrong, and the correct message.

How a detective works: check every step on its own. Identify the step on scrap paper. The first step that does not match the wrong one. Everything after it may look right, but it was built on the mistake.

Legend's work: Solve $4x - 3(x - 5) = 21$

STEP 1: $4x - 3x - 15 = 21$ Wrong step: What went wrong?

STEP 2: $x - 15 = 21$ What went wrong?

STEP 3: $x = 36$ Correct answer: _____

Elspeth's work: Find the slope of the line through (2, 7) and (6, -1).

STEP 1: $m = (1 - 7) / (-2 - 6)$ Wrong step: What went wrong?

STEP 2: $m = (-1 - 7) / (-2 - 6)$ What went wrong?

STEP 3: $m = -8 / -4 = 2$ Correct answer: _____

Thaddeus's work: Simplify $(3x^2)(2x^3)$

STEP 1: $3 \times 2 = 6$ Wrong step: What went wrong?

STEP 2: $x^2 \times x^3 = x^6$ What went wrong?

STEP 3: Answer: $6x^6$ Correct answer: _____

Ordine's work: Expand $(x + 4)^2$

STEP 1: Square each term: $(x + 4)^2 = x^2 + 4^2$ Wrong step: What went wrong?

STEP 2: $x^2 + 16 = 36$ What went wrong?

STEP 3: Answer: $x^2 + 36$ Correct answer: _____

Seaver's work: Solve $-2x + 7 = 15$

STEP 1: $-2x = 15 - 7$ Wrong step: What went wrong?

STEP 2: $-2x = 8$ (divide both sides by -2) What went wrong?

STEP 3: Answer: $x = 4$ Correct answer: _____

Challenge

Pick one case on this page. Write a NEW problem of the same kind where the same mistake would give a wrong answer, and solve it correctly.

Name: _____ Score: _____ / 15

2. Math Error Detective, 40 min (solo)

Practice Menu A

Solve each problem. Find your answer in the code book and write it in the answer box.

Code book:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Problems:

- $5(x + 3) = 14$. Find $5x$.
- Solve $5x + 2 = 3x + 20$.
- $(2)^2 - 3$
- The slope of the line through (1, 4) and (5, 14).
- $x + 121$ and $x + 8$. Find x .
- $x^2 + 34 = 0$ and $x + 8$. Find x .
- The negative solution of $(x - 3) = 7$.
- $x^2 + 34 = 0$ and $x + 8$. Find x .
- The hypotenuse of a right triangle with legs 7 and 24.
- The 10th term of 4, 7, 10, 13, ...
- The mean of 14, 18, 22 and 30.
- The y-intercept of $y = 2(x + 7)$.

The message:

Challenge: Solve $x^2 - 3x + 28$. Give both solutions.

Name: _____ Score: _____ / 12

3. Practice Menu, 45 min (solo)

Partner Check

Solve one case with your partner. Partner A: Solve one case with your partner. Partner B: Solve one case with your partner. The answers should be the same. If not, find the slip together.

Linear Equations

Solve $5x - 7 = 2x + 17$. Answer: _____

Slope

Slope of the line through (-1, 3) and (3, -5). Answer: _____

Function Notation

$f(x) = x^2 - 4x$. Find $f(3)$. Answer: _____

Systems of Equations

$y = 2x + 1$ and $y = x + 5$. Find x . Answer: _____

Exponent Rules

Simplify $(x^2)^3 \cdot x$. Answer: _____

Quadratic Equations

$x^2 + 3x - 40 = 0$ has one positive solution. Find it. Answer: _____

Rational

12×13 . Answer: _____

Exponential Functions

3×2^4 . Answer: _____

Special Right Triangles

A 30-60-90 triangle has a short leg of 7. How long is the hypotenuse? Answer: _____

Probability

A coin is flipped twice. Pheads both times? Answer: _____

Challenge

The distance between (-2, 1) and (6, 7). Answer: _____

Name: _____ Partner: _____

4. Partner Check, 40 min (pairs)

Price the Spring Concert

Part 1: the model

The ticket model

The school band is pricing tickets for its spring concert. From past concerts, if tickets were free, about 600 people would come, and every \$1 added to the price keeps about 40 people away.

People who come: $A(p) = 600 - 40p$. (p = ticket price in dollars)

Costs: \$500 for the band, plus \$2 per person for programs and snacks.

Questions:

- As a ticket price of \$5, how many people come?
- What is the revenue (money from tickets) at \$5?
- At what ticket price would nobody come?
- Revenue is price times attendance: $R(p) = p(600 - 40p)$. Write $R(p)$ in standard form.
- Find the revenue at \$10. Why is it the same as the revenue at \$5?
- Which ticket price brings in the most revenue, and how much is it?
- Use the costs in the box. What is the profit (revenue minus costs) at \$5?
- What is the profit at \$5.00?

Challenge

The band wants at least 300 people in the seats. What is the highest ticket price that allows this, and what revenue does it bring?

Name: _____ Score: _____ / 15

5. Price the Spring Concert, 40 min (pairs)

Math Puzzle Tournament

Solve each puzzle with your team. Write your answers on the answer sheet.

Round 1: Algebra (1 PT EACH)

- Solve $7 - 2x = 19$.
- Factor $x^2 - 11x + 24$.
- Simplify $(4x^2)(3x^3)$.
- Which integers make $-2 < 3x + 1 \leq 10$ true?
- Let $h(x) = 2x^2 + 1$. Evaluate $h(3)$.
- Three integers add up to 23, and one is 7 more than the other. What is the largest number?
- Solve $A = \frac{1}{2}(b_1 + b_2)h$ for b_1 when $A = 36$ and $h = 3$.
- Five integers in a row add up to 135. What is the largest of the five?

Round 2: Geometry and Trig (2 PT EACH)

- What is the measure of each interior angle of a regular heptagon?
- How far apart are the points (3, 2) and (5, -4)?
- What is the midpoint of the segment from (-4, 7) to (10, -1)?
- The hypotenuse of a 30-60-90 triangle is 18. How long is the shorter leg?
- Two triangles are similar. Matching sides are 4 cm and 10 cm. The smallest triangle's area is 12 square cm. What is the largest triangle's area?
- A circle has a radius of 6 cm. How long is the arc of a 60° sector? Answer in terms of π .
- In a right triangle, the side opposite angle A is 9 and the hypotenuse is 15. What is $\cos A$?
- Two triangles are similar. Matching sides are 4 cm and 10 cm. The smallest triangle's area is 12 square cm. What is the largest triangle's area?
- What is the volume in terms of π ?

Round 3: Functions and Data (3 PT EACH)

- An arithmetic sequence has a first term of 3 and a sixth term of 30. What is the 20th term?
- What is the 6th term of the sequence 3, 12, 48, ...?
- The graph of $y = x^2$ is moved 4 units right and 2 units down. Write the new equation.
- What is the vertex of $y = 2x^2 - 12x + 7$?
- Find the standard deviation of 3, 5, 7, 9. (Round them as the whole population.) In the nearest tenth.
- A population has a radius of 3 cm and a height of 10 cm. What is its volume in terms of π ?
- A line through (2, 5) has a slope of -3. At what x value does it cross the x-axis?
- The square of a positive number is 50 more than the number. What is the number?

Name or team: _____ Score: _____ / 15

6. Math Puzzle Tournament, 41 min (teams)

The Robotics Showcase Mix-Up

Read the story. Every clue is true. Use the math. Fill in the grid. Answer the case question.

The Robotics Showcase opens tonight. Five students each built one robot, set it up at one of five tables numbered 1 to 5, and ran it in front of the judges this afternoon. Every robot got a point total. Then the judges' laptops crashed, and the results file is gone. Their scribbled notes survived, and every note is true, but each one is written as a math fact. Rebuild the results before the doors open.

The five point totals: 45, 54, 60, 72, 80

The clues:

- The Star Climber scored 20% more points than the Ball Slinger.
- The mean of the point totals at table 1 and table 2 is 63.
- The Plant Walker's table number is twice the Maze Runner's table number.
- Brony's points are $\frac{3}{4}$ of the Ball Slinger's points.
- Octavian's points and Caspian's points add up to 132.
- Octavian's table number times Peregrine's table number is 5.

The case question: Which robot is at table 3, and how many points did it score?

Scrap paper for the math

Clue 1	Clue 2	Clue 3
Clue 4	Clue 5	Clue 6

Warm-up the battery test

Rosalee, Evander, and Henke each tried a robot's battery 18, 24 or 30 minutes.

- The mean of Rosalee's and Evander's times is 21 minutes.
- Rosalee's battery lasted longer than Evander's.
- $x = \text{no. minutes}$. You. One guess in every one and solution.

Name: _____ Score: _____ / 15

7. The Robotics Showcase Mix-Up, 40 min (teams)

Which Is Greater?

Stand-off sheet

Circle your guess: > or < or =. Then write if true and circle your TRUE answer: 1 means they are equal.

Questions:

- $3(4)$ when $3(4) = 12$ or 12 .
- $4(5)$ when $4(5) = 20$ or 20 .
- $5(6)$ or $6(5)$.
- $7(8)$ or $8(7)$.
- $9(10)$ or $10(9)$.
- The slope of $y = -3x + 8$.
- The slope of the line through (2, 3) and (4, -6).
- $\tan 30^\circ$.
- $\cos 60^\circ$.
- The mean of 2, 4, 6, 8, 10.
- The median of 2, 4, 6, 8, 10.
- 1000 or 10000.
- 1000 or 10000.
- 10^3 or 10^4 .
- 10^3 or 10^4 .
- The greatest value of $y = x^2 + 4x$.
- The y-intercept of $y = 2x + 5$.
- $(-1)^2$ or (-1) .
- $(-1)^2$ or (-1) .

Challenge

Which is greater: $(1.5)^2$ or 1.5^2 ? Then write your own pair of different-looking expressions that are exactly equal.

Name: _____ Score: _____ / 12

8. Which Is Greater? Stand-Off, 40 min (whole class)

Whiteboard Quiz Game

Tap the page up or copy the board. Cross off each square once it is played.

Equations	Functions	Quadratics	Exponents	Geometry
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

Team scores

Team	POINTS (AS YOU GO)	TOTAL
1		
2		
3		
4		
5		

Name or team: _____ Score: _____ / 15

9. Whiteboard Quiz Game, 35 min (whole class)



The Robotics Showcase Mix-Up

Sub script: a team logic mystery with math clues

One period • teams of 3 or 4

This activity practices: the mean, fractions and percent of a number, sums, products and multiples, reasoning from clues



SAY THIS TO THE CLASS

"The judges' results file for the Robotics Showcase is gone, and your team rebuilds it from their notes. Every note is a true math fact: do the math on scrap paper first, then mark the grid with an X for no and a circle for yes. We start with a short warm-up together."

Materials

- Teams of 3 or 4. Each team gets one case file and one grid sheet (the grid sheet has the answer slip).
- Pencils (erasers help), scrap paper for the math, and the board for the warm-up.
- Jobs: **reader** (reads the clues out), **calculator** (does the math of a clue on scrap paper), **marker** (the only one who writes in the grid) and **recorder** (fills in the slip).
- Keep this page and the next one: together they are your key.

Run it (40 minutes)

- Set up.** Make the teams, hand out the sheets. 3 min
- Read the story.** A volunteer reads the story on the case file out loud. 3 min
- Warm-up together** on the board, as shown below. 6 min
- Teams solve the case.** Walk around. After about 10 minutes, give a hint from the next page to any team that is stuck. Fast teams answer the bonus question. 23 min
- Reveal.** Collect the slips, then read the answer and the full solution from the key. 5 min

The warm-up: teach the grid (6 minutes)

Draw this grid on the board. Students have the same one on their case file. Rosalind, Evander and Henrike each timed a robot's battery: 18, 24 or 30 minutes. Read the two clues:

- The mean of Rosalind's and Evander's times is 21 minutes.
- Rosalind's battery lasted longer than Evander's.

Then show it step by step:

- Clue 1 first, because it has the math: a mean of 21 for two times means they add up to 42. Which two of 18, 24 and 30 add up to 42? Only 18 and 24. So Henrike has the time left over: circle Henrike under 30. A circle means the rest of that row and that column get an X.
- Clue 2: Rosalind's battery lasted longer than Evander's. Of 18 and 24, the longer one is 24, so Rosalind has 24 and Evander has 18. Circle both.
- Check it against both clues out loud: $(24 + 18) \div 2 = 21$, and 24 is more than 18.

The two rules to say out loud: one circle in every row and every column of each small grid; and in this case, do the math of a clue on scrap paper first, then mark the grid. An X means no, a circle means yes.

	18	24	30
Rosalind			
Evander			
Henrike			

Answer: Rosalind, 24; Evander, 18; Henrike, 30.



Math Error Detective Cases 1 to 5

Each solution has exactly one wrong step. Write its number, what went wrong, and the correct answer.

Math Error Detective


How a detective works: check every step on its own. Redo the step on scrap paper. The first step that does not match is the wrong one. Everything after it may look right, but it was built on the mistake.

1 Leopold's work: Solve $4x - 3(x - 5) = 21$

STEP 1 $4x - 3x - 15 = 21$

STEP 2 $x - 15 = 21$

STEP 3 $x = 36$

Wrong step ☐

What went wrong?

Correct answer

2 Elspeth's work: Find the slope of the line through (2, 7) and (6, -1).

STEP 1 $m = (y_2 - y_1) \div (x_2 - x_1)$

STEP 2 $m = (-1 - 7) \div (2 - 6)$

STEP 3 $m = -8 \div -4 = 2$

Wrong step ☐

What went wrong?

Correct answer

3 Thaddeus's work: Simplify $(3x^4)(2x^5)$

STEP 1 $3 \times 2 = 6$

STEP 2 $x^4 \times x^5 = x^{20}$

STEP 3 Answer: $6x^{20}$

Wrong step ☐

What went wrong?

Correct answer

4 Ondine's work: Expand $(x + 6)^2$

STEP 1 Square each term: $(x + 6)^2 = x^2 + 6^2$

STEP 2 $6^2 = 36$

STEP 3 Answer: $x^2 + 36$

Wrong step ☐

What went wrong?

Correct answer

5 Severin's work: Solve $-2x + 7 > 15$

STEP 1 $-2x > 8$

STEP 2 $x > -4$ (divide both sides by -2)

STEP 3 Answer: $x > -4$

Wrong step ☐

What went wrong?

Correct answer

★ Challenge

Pick one case on this page. Write a NEW problem of the same kind where the same mistake would give a wrong answer, and solve it correctly.

Name Score / 15

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Math Error Detective · cases 1 to 5



Practice Menu A Secret Message

Solve each problem. Find your answer in the code bank and write its letter. The letters, in order, spell a message.

Practice Menu

Code bank

-19	A	-11	U	-4	T	4	I	5	V	6	T	8	S	9	O	10	N	11	E	13	L
14	E	21	C	25	W	31	I	34	R												

Four numbers in the bank belong to no problem. Your answer is not in the bank? Check your work again.

1

$f(x) = 3x - 7$. Find $f(5)$.

Answer Letter ☐

2

Solve $5x + 2 = 3x + 20$.

Answer Letter ☐

3

$(-2)^4 - 3$

Answer Letter ☐

4

The slope of the line through (1, 4) and (3, 14)

Answer Letter ☐

5

$x^2 = 121$ and $x > 0$. Find x .

Answer Letter ☐

6

$8^{2/3}$

Answer Letter ☐

7

The negative solution of $|x - 3| = 7$

Answer Letter ☐

8

$x^2 + 3x - 54 = 0$ and $x > 0$. Find x .

Answer Letter ☐

9

The hypotenuse of a right triangle with legs 7 and 24

Answer Letter ☐

10

The 10th term of 4, 7, 10, 13, ...

Answer Letter ☐

11

The mean of 14, 18, 22 and 30

Answer Letter ☐

12

The y-intercept of $y = 2(x + 7)$

Answer Letter ☐

The message

1	2	3	4	5	6	7	8	9	10	11	12
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Challenge Solve $x^2 - 3x = 28$. Give both solutions.

Name Score / 12



Partner Check Partner A

Solve one row, then compare with your partner. The answers should be the same. If not, find the slip together.

Partner Check

LINEAR EQUATIONS

1 Solve $5x - 7 = 2x + 17$

Answer

☐ Same as my partner

SLOPE

2 Slope of the line through $(-1, 3)$ and $(3, -5)$

Answer

☐ Same as my partner

FUNCTION NOTATION

3 $f(x) = x^2 - 4x$. Find $f(-3)$.

Answer

☐ Same as my partner

SYSTEMS OF EQUATIONS

4 $y = 2x - 1$ and $y = x + 3$. Find x .

Answer

☐ Same as my partner

EXPONENT RULES

5 Simplify $(x^3)^2 \cdot x$

Answer

☐ Same as my partner

QUADRATIC EQUATIONS

6 $x^2 + 3x - 40 = 0$ has one positive solution. Find it.

Answer

☐ Same as my partner

RADICALS

7 $\sqrt{12} \times \sqrt{3}$

Answer

☐ Same as my partner

EXPONENTIAL FUNCTIONS

8 3×2^4

Answer

☐ Same as my partner

SPECIAL RIGHT TRIANGLES

9 A 30-60-90 triangle has a short leg of 7. How long is the hypotenuse?

Answer

☐ Same as my partner

PROBABILITY

10 A coin is flipped twice. $P(\text{heads both times})$?

Answer

☐ Same as my partner

★ Challenge

The distance between $(-2, 1)$ and $(6, 7)$

Then compare with your partner. Same answer again?

My name Partner



Math Puzzle Tournament

Puzzle sheet

Solve each puzzle with your team. Write your answers on the answer sheet.

Math Puzzle Tournament



Round 1: Algebra

1 PT EACH

- Solve $7 - 2x = 19$.
- Let $h(x) = 2x^2 + 1$. Evaluate $h(-3)$.
- Factor $x^2 - 11x + 24$.
- Two numbers add up to 23, and one is 7 more than the other. What is the larger number?
- Simplify $(4x^2y)(3xy^3)$.
- Solve $A = \frac{1}{2}bh$ for h when $A = 36$ and $b = 9$.
- Which integers x make $-2 < 3x + 1 \leq 10$ true?
- Five integers in a row add up to 135. What is the largest of the five?



Round 2: Geometry and Trig

2 PT EACH

- What is the measure of each interior angle of a regular hexagon?
- How far apart are the points $(-3, 2)$ and $(5, -4)$?
- What is the midpoint of the segment from $(-4, 7)$ to $(10, -1)$?
- A circle has a radius of 6 cm. How long is the arc of a 60° sector? Answer in terms of π .
- The hypotenuse of a 30-60-90 triangle is 18. How long is the shorter leg?
- In a right triangle, the side opposite angle A is 9 and the hypotenuse is 15. What is $\cos A$?
- Two triangles are similar. Matching sides are 4 cm and 10 cm. The small triangle's area is 12 square cm. What is the large triangle's area?
- A cylinder has a radius of 3 m and a height of 10 m. What is its volume in terms of π ?



Round 3: Functions and Data

3 PT EACH

- An arithmetic sequence has a first term of 5 and a sixth term of 30. What is the 20th term?
- What is the 6th term of the sequence 3, 12, 48, ...?
- The graph of $y = x^2$ is moved 4 units right and 2 units down. Write the new equation.
- What is the vertex of $y = 2x^2 - 12x + 7$?
- Find the standard deviation of 3, 5, 7, 9, 11 (treat them as the whole population), to the nearest tenth.
- $f(x) = 2x + 1$ when $x < 3$, and $f(x) = x^2 - 4$ when $x \geq 3$. What is $f(1) + f(3)$?
- What is the smallest whole number x that makes 3×2^x greater than 1,000?
- A line through $(2, 5)$ has a slope of -3 . At what x -value does it cross the x -axis?



Challenge Tiebreaker

The square of a positive number is 56 more than the number. What is the number?

Name or team _____

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Math Puzzle Tournament · puzzle sheet



How Tall Is That Tree? Article

Read the whole text before you look at the questions.

Quiet Reading

How Tall Is That Tree?

Foresters and curious students all meet the same problem: a tree is far too tall to measure with a tape. Instead, they measure it from the ground with two ideas from geometry class, similar triangles and the tangent ratio.

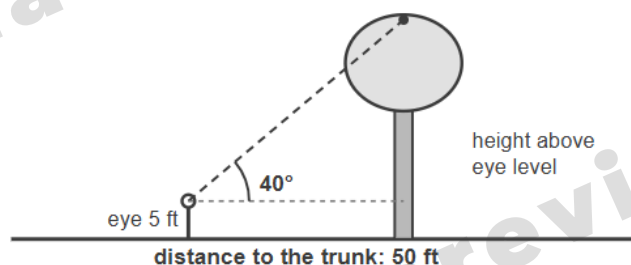


The first method needs a sunny day. Push a straight stick into level ground and measure the stick and its shadow. At the same moment, measure the tree's shadow. The sun's rays hit the stick and the tree at the same angle, so the stick and its shadow form a small right triangle and the tree and its shadow form a large one with the same shape. In similar triangles, matching sides are in the same ratio. If a 3-foot stick casts a 2-foot shadow, every upright object nearby is 1.5 times as tall as its shadow is long, so a tree with a 40-foot shadow is about 60 feet tall.

On a cloudy day there are no shadows, so foresters use an angle instead. They stand a measured distance from the trunk and aim a clinometer at the top of the tree. A simple clinometer is a protractor with a straw taped along its flat edge and a weighted string hanging from its center. The string shows the angle of elevation, the angle between level ground and the line of sight up to the treetop.

The height comes from the tangent ratio. In a right triangle, the tangent of an angle is the opposite side divided by the adjacent side. Here the adjacent side is the distance to the trunk, and the opposite side is the height of the tree above eye level. Standing 50 feet away with an angle of 40° , a forester multiplies the distance by $\tan 40^\circ$, which is about 0.84: $50 \times 0.84 = 42$ feet. One last step is easy to forget. The angle was measured from the forester's eyes, not from the ground, so the eye height of 5 feet is added, and the tree is about 47 feet tall.

Careful measurers know their numbers are estimates. A reading that is off by two degrees can change the answer by several feet, so they take three readings and use their mean. Some skip the tangent entirely: they walk back until the angle is exactly 45° . The tangent of 45° is 1, so the height above eye level equals the distance to the trunk.



The angle method from the article (the eye height is not to scale).

In the full binder

A whole math sub day, planned and ready to print.

36 pages in color and ink-saver
B&W, US Letter and A4

9 activities of 35 to 45 minutes, one
per class period

7 front pages: note to the sub,
lesson plan, schedule, class list

3 + 6 individual activities +
partner, team and
whole-class activities

Use it your way

- A sudden sick day: emergency sub plans that are ready before you need them.
- Any high school math class, grades 9 to 12: every activity fits a 40 to 55 minute period. Mostly Algebra 1, with some Geometry and Algebra 2; students may skip a topic they have not met yet.
- Your sub tub: print it once and keep it all year.
- Your own no prep day: teach it yourself when you need a break from planning.

Thank you! If this works for your class, a quick review helps other teachers find it, and earns you TpT credits.



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